

WHAT IS CLAIMED IS:

1. A hydroforming apparatus (10) comprising:
 - a hydroforming die member (14);
 - a hydroforming press (16, 18) having a housing (22);
 - a fastener assembly (37) comprising a fastener (24) having a shaft (30) terminating at a shoulder (32), the shoulder forming a head (33), and a spacer (29) disposed about the fastener (24);
 - the fastener (24) secured to the press housing (22) at one end of the shaft (30) and the shoulder (32) of the fastener (24) received within a slot (28) formed in the die member (14) for connecting the die member (14) and press (16, 18).
2. The hydroforming apparatus (10) of Claim 1 wherein the spacer (29) is positioned between the die member (14) and press housing (22).
3. The hydroforming apparatus (10) of Claim 1 wherein the first end of the shaft (30) comprises a threaded end (31) for mating with a nut (36).
4. The hydroforming apparatus (10) of Claim 1 wherein the slot (28) is formed in a lower die member (21).
5. The hydroforming apparatus (10) of Claim 4 wherein the slot (28) has a keyhole structure and is formed in an upwardly projecting structure (59) formed in the lower die member (21).
6. The hydroforming apparatus (10) of Claim 1 wherein the slot (28) comprises a wider portion (60) and a narrower portion (62) both having a top opening (64).
7. The hydroforming apparatus (10) of Claim 6 wherein the wider portion (60) is configured to receive the shoulder (32) of the fastener (24).

8. The hydroforming apparatus of Claim 1 wherein the slot (28) includes transversely extending wall surfaces (58) for engaging an annular surface (56) of the shoulder (32).

9. The hydroforming apparatus of Claim 1 wherein a slot (68) comprises a pair of upwardly projecting structures (70, 72) integrally formed on a lower die member (67).

10. The hydroforming apparatus of Claim 9 including a transversely extending groove (78) formed adjacent the structures (70, 72) for receiving a portion of the head (33) of the fastener (24).

11. The hydroforming apparatus of Claim 1 including a tube engaging structure (20) mounted in the press housing (22) for longitudinal movement with respect to the die member (14) and press housing (22).

12. The hydroforming apparatus of Claim 1 wherein the fastener assembly (37) is loosely attached to the press housing (22) for allowing a single person to configure a press housing (22) and die member (14).

13. The hydroforming apparatus of Claim 1 wherein the spacers (29) operate to align a central passageway (54) formed in the press housing (22) with an adjacent end portion of a die cavity (44) and to space the press housing (22) a predetermined distance from the die member (14).

14. A hydroforming apparatus (10) comprising:
a hydroforming die member (14);
a hydroforming press (16, 18) having a housing (22);
a fastener assembly (37) comprising a fastener (24) having a shaft (30) terminating at a shoulder (32), the shoulder forming a head (33), and a spacer (29) disposed about the fastener (24) and spacing the die member (14) relative to the press housing (22);

the fastener (24) secured to the housing (22) at one end of the shaft (30) and, the slot (28) being configured to receive the shoulder (32) when inserted into the slot (28) in a direction that is transverse to a longitudinal axis of the fastener (28).

15. A method of attaching a hydroforming press (16, 18) to a hydroforming die member (14), comprising:

providing a hydroforming die member (14);

providing a hydroforming press (16, 18) having a housing (22);

providing a fastener assembly (37) comprising a fastener (24) having a longitudinal axis and a shaft (30) terminating at a shoulder (32), the shoulder forming a head (33), and a nut (36);

providing the die member (14) with a slot (28) configured to receive the shoulder (32) in a direction that is transverse to the longitudinal axis of the fastener (24)

providing a spacer (29) disposed about the fastener (24) to space the die member (14) relative to the press housing (22);

securing the shaft (30) of the fastener (24) to the housing (22); and

positioning the shoulder (32) of the fastener (24) within the slot (28) in the die member (14) by moving the shoulder (32) and the fastener (24) in a direction that is transverse to the longitudinal axis of the fastener (24).

16. The method of attaching a hydroforming press (16, 18) to a hydroforming die member (14) of Claim 15 including the step of positioning the spacers (29) between a side (38) of the die member (14) and a side (40) of the press housing (22) to engage the die member (14) and the press housing (22).

17. The method of attaching a hydroforming press (16, 18) to a hydroforming die member (14) of Claim 15 including the step of tightening nuts (36) to a specified level to secure the die member (14) to the press housing (22) after positioning the shoulder (32) within the slot (28).

18. The method of attaching a hydroforming press (16, 18) to a hydroforming die member (14) of Claim 17 including the step of positioning a tube engaging structure (20) within the press housing (22) following the step of tightening the nuts (36).

19. The method of attaching a hydroforming press (16, 18) to a hydroforming die member (14) of Claim 18 including the step of performing a hydroforming operation following the step of positioning the tube engaging structure (20).